What is claimed:

1. An ionomer comprising a reaction product of the reaction between a halogenated isoolefin copolymer and at least one phosphorus based nucleophile comprising at least one pendant vinyl group.

2. The ionomer of claim 1, wherein a halogenated isoolefin copolymer comprises repeating units derived from at least one isoolefin monomer, and repeating units derived from one or more multiolefin monomers, one or more alkyl substituted aromatic vinyl monomers or a mixture thereof.

3. The ionomer of claim 2, wherein said halogenated copolymer comprises at least one allylic halogen moiety, or at least one halo alkyl moiety or both.

4. The ionomer of claim 2, wherein said halogenated copolymer comprises repeating units derived from said at least one isoolefin and repeating units derived from said one or more multiolefin monomers.

5. The ionomer of claim 2, wherein one or more of said repeating units derived from said multiolefin monomers comprise an allylic halogen moiety.

6. The ionomer of claim 5, wherein said one or more multiolefin monomers are selected from C4-C16 conjugated diolefins.

7. The ionomer of claim 6, wherein said conjugated diolefin is isoprene.

8. The ionomer of claim 2, wherein said halogenated copolymer comprises repeating units derived from said at least one isoolefin and repeating units derived from said one or more alkyl substituted aromatic vinyl monomers.

9. The ionomer of claim 8, wherein one or more of said repeating units derived from said aromatic vinyl monomers comprise a halo alkyl moiety

10. The ionomer of claim 2, wherein said halogenated copolymer comprises repeating units derived from said at least one isoolefin, repeating units derived from said one or more multiolefin monomers, and repeating units derived from said one or more alkyl substituted aromatic vinyl monomers.

11. The ionomer of claim 10, wherein one or more units derived from said multiolefin monomers comprise an allylic halogen moiety and/or one or more units derived from said alkyl substituted aromatic vinyl monomers comprise a halo alkyl moiety.

12. The ionomer of any one of claims 8 to 11, wherein the aromatic group in the alkyl substituted aromatic vinyl monomer is benzene, naphthalene, anthracene, phenanthrene or biphenyl.

13. The ionomer of any one of claims 8 to 11, wherein the alkyl substituted aromatic vinyl monomer is C_1-C_4 alkyl substituted styrene.

14. The ionomer of claim 13, wherein the alkyl substituted aromatic vinyl monomer is o-methyl styrene, p-methyl styrene, or m-methyl styrene.

15. The ionomer of any one of claims 1 to 14, wherein the isoolefin monomer comprises a C_4 to C_8 isomonoolefin monomer.

16. The ionomer of claim 15, wherein the isomonoolefin monomer comprises isobutylene.

17. The ionomer of claim 1, wherein said halogenated copolymer comprises halobutyl rubber.

18. The ionomer of claim 1, wherein said halogenated copolymer comprises a copolymer of isobutylene and p-methyl styrene, wherein one or more

repeating units derived from said p-methyl styrene have a benzylic halogen group.

19. The ionomer of claim 1, wherein said halogenated copolymer comprises a terpolymer of isobutylene, isoprene and p-methyl styrene, wherein one or more repeating units derived from said isoprene have an allylic halogen moiety and/or one or more repeating units derived from said p-methyl styrene have a benzylic halogen group.

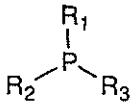
20. The ionomer of any one of claims 1 to 19, wherein said halogenated copolymer is a star branched polymer.

21. The ionomer of any one of claims 2 to 19, wherein said polymer comprises from about 0.2 to about 20 mol% of the units derived from said conjugated multiolefins.

22. The ionomer of claim 21, wherein the repeating units derived from said conjugated multiolefin is from about 0.5 to about 2.5 mol%.

23. The ionomer of claim 21, wherein the repeating units derived from said conjugated multiolefin is from about 3.0 to about 8.0 mol%.

24. The ionomer of any one of claims 1 to 23, wherein the phosphorus based nucleophile has the formula:



wherein:

R_1, R_2 and R_3 are independently:

a linear or branched C_1-C_{18} alkyl group optionally comprising one or more hetero atoms, one or more carbonyl groups or combinations thereof; C6 to

C10 aryl; C3-C6 heteroaryl; C3-C6 cycloalkyl; C3-C6 heterocycloalkyl; or combinations thereof;

wherein at least one of R_1, R_2 and R_3 contains a pendant vinyl group.

25. The ionomer of claim 24, wherein, at least one of R_1, R_2 and R_3 is a linear or branched C_1-C_{18} alkyl group having a pendent vinyl group represent by the formula $-CH=CH_2$.

26. The ionomer of claim 24 wherein, at least one of R_1, R_2 and R_3 is a linear or branched C_1-C_{18} alkyl group or C_6 to C_{10} aryl; optionally substituted with $-C(O)-C(=CR'R'')R_4$, or $-C(O)R_4$, wherein R', R'' and R_4 are independently C1-C6 alkyl or H.

27. The ionomer of claim 24 wherein, at least one of R_1, R_2 and R_3 is a C_6 to C_{10} aryl substituted with a pendent vinyl group or substituted with a linear or branched C_1-C_{18} alkyl group having a pendant vinyl group, wherein the pendant vinyl group is represented by the formula $-CH=CH_2$.

28. The ionomer of claim 24, wherein the nucleophile is selected from the group consisting of diphenylphosphinostyrene (DPPS), allyldiphenylphosphine, diallylphenylphosphine, diphenylvinylphosphine, triallylphosphine, and mixtures thereof.

29. The ionomer of claim 28, wherein the nucleophile is DPPS.

30. A process for preparing an ionomer comprising the steps of:

providing a halogenated isoolefin copolymer;

providing at least one phosphorus based nucleophile comprising at least one pendant vinyl group; and

reacting the halogen moiety of said halogenated copolymer with the nucleophile to form the ionomer.

31. The process according to claim 30, wherein the halogenated isoolefin copolymer comprises repeating units derived from at least one isoolefin monomer, and repeating units derived from one or more multiolefin monomers, one or more alkyl substituted aromatic vinyl monomers or a mixture thereof.

32. The process of claim 30 or 31, wherein said halogenated copolymer is a star branched copolymer.

33. The process according to claim 30, wherein the nucleophile is reacted with the halogenated copolymer in the range from about 1 to 5 molar equivalents based on total molar amount of the halogen present in the halogenated polymer.

34. A process for preparing a cured polymer comprising the steps of:

providing a halogenated isoolefin copolymer;

providing at least one phosphorus based nucleophile comprising at least one pendant vinyl group;

reacting the halogen moiety of said halogenated copolymer with the nucleophile to form an ionomer; and

curing the ionomer by heating at a suitable curing temperature.

35. The process of claim 34, wherein said curing temperature is about 80 °C to about 250 °C.

36. The process of claim 34 or 35, wherein the curing step further comprises adding a peroxide curing agent.

37. The process of any one of claims 34 to 36, wherein said process comprises forming said ionomer prior to the curing step.

38. The process of any one of claim 34 to 36, wherein said process comprises forming said ionomer during the curing step.

39. The process according to any one of claims 34 to 38, wherein the peroxide curing agent comprises dicumyl peroxide, di-tert-butyl peroxide, benzoyl peroxide, 2,2'-bis (*tert*-butylperoxy) diisopropylbenzene, benzoyl peroxide, 2,5-dimethyl-2,5-di(*tert*-butylperoxy)-hexyne-3, 2,5-dimethyl-2,5-di(benzoylperoxy)hexane, or (2,5-bis(*tert*-butylperoxy)-2,5-dimethyl hexane.

40. The process according to any one of claims 34 to 39, wherein the peroxide curing agent is added in an amount of from 0.01 to 7 phr.

41. The process according to any one of claims 34 to 40, wherein the neucleophile is reacted with the halogenated copolymer in the range from about 1 to 5 molar equivalents based on total molar amount of the halogen group.

42. The process according to any one of claims 34 to 41, wherein the process further comprises admixing a peroxide curing co-agent with the peroxide curing agent and the ionomer.

43. The process according to claim 42, wherein the co-agent comprises triallyl isocyanurate (TAIC), N,N'-*m*-phenylene dimaleimide, triallyl cyanurate (TAC) or liquid polybutadiene.

44. The process according to claim 34 wherein the ionomer comprises total unsaturation of the copolymer and the pendant vinyl group in an amount greater than or equal to 1.0 mol %

CLAIMS

1. An invention not claimed in any divisional application.